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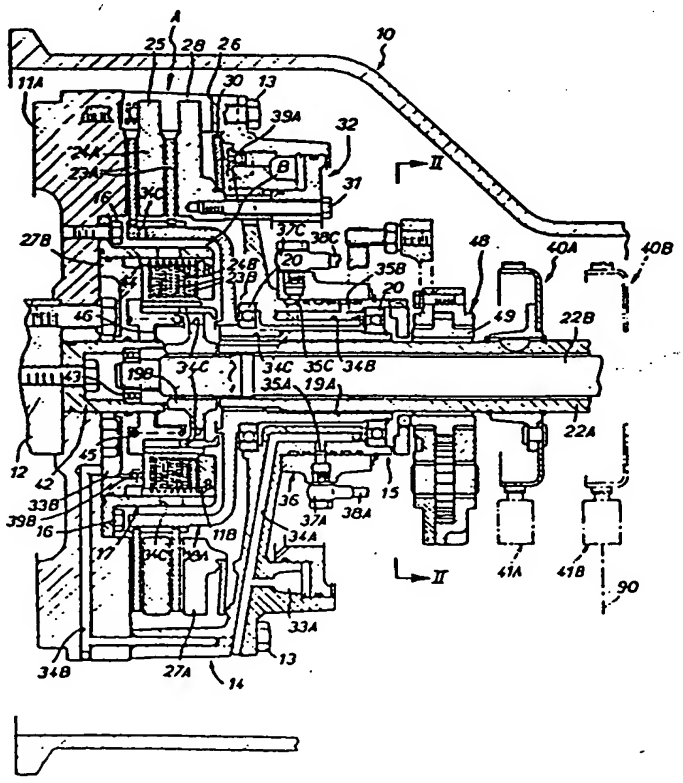
F2C
(71) Applicant
Societe Anonyme
Francaise du Ferodo
64 Avenue de la
Grande-Armee
75017 Paris
France
(72) Inventor
Aldo Marchisio
(74) Agents
Page White & Farrer

(54) Clutch with two outputs

(57) In a clutch arrangement, particularly for tractors, comprising two clutch assemblies A, B, each for controlling separate driven shafts 22A, 22B, the clutch assembly A is arranged annularly completely around the clutch assembly B, and a circuit (38C, 37C, 35C, 34C) for cooling fluid is provided in these clutch assemblies. Each clutch assembly is associated with a fluid controlled band brake 40A, 40B which together with the clutch assemblies are connected to a common fluid-control circuit. The circuit supplies liquid under pressure to pistons 32, 27B respectively for disengaging and engaging the clutch assemblies A, B against spring pressure, such spring pressure being provided by a diaphragm spring 30 for clutch assembly A and a helical spring 45 for clutch assembly B. Centrifugally controlled valves prevent overpressures.

FIG.1



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SPECIFICATION

Clutch with two outputs

This invention relates generally to clutches with two outputs, of the type usually fitted to certain motor vehicles, such as tractors for example, which, in addition to their movement coupling, have a force coupling.

In general, clutches of this kind comprise, in a casing, two clutch assemblies each having a first plate, known as the reaction plate, rotationally fast with a first shaft, generally a drive shaft, at least one friction disc mounted so as to be axially movable relative to the reaction plate and rotationally fast with a second shaft, generally a driven shaft, a second plate known as the pressure plate which is mounted so as to be axially movable relative to the reaction plate and keyed to the latter to be rotationally fast therewith, engagement means adapted to urge the pressure plate towards the reaction plate, and disengagement means adapted to urge the pressure plate in the direction opposite the reaction plate.

The production of clutches of this type must meet various requirements; in particular, it should result in the minimum axial dimensions and enable suitable cooling of the clutch.

This latter requirement is imperative, when the clutch is used in a tractor which has to make various back and forth manoeuvres of limited duration, as is the case, for example, with a caterpillar tractor equipped with a shovel or other excavating tool; these manoeuvres require a rapid succession of disengagements and engagements of the advancing clutch of a tractor of this kind.

U.S. Patent specification No. 2 712 373 described a clutch with two outputs in which there is provided a circulation circuit for the circulation of cooling fluid in the two clutch assemblies which it comprises. However, in this US Patent specification No. 2 712 373, the two clutch assemblies are arranged axially behind each other and parallel to each other. This solution is acceptable for certain applications, particularly for those which, as in this case, use clutch assemblies with only one friction disc, but it is not acceptable for others in which it is essential to have the minimum axial dimensions. This is particularly true when multidisc clutch assemblies have to be used, as is usually the case with tractors.

US Patent specification No. 3 746 138 describes a clutch with two outputs using multidisc clutch assemblies of this kind, and all these clutch assemblies are arranged annularly inside one another, thus advantageously reducing the overall axial dimensions of the clutch. However, in this US Patent specification No. 3 746 138, there is no circulation of cooling fluid in the clutch assemblies in question.

This invention relates to a clutch with two outputs which advantageously combines a reduced axial buld with a circulation of cooling fluid.

According to the invention there is provided a clutch, of the kind hereinbefore described, in which the two clutch assemblies are arranged fully annularly one inside the other, one of these clutch assemblies, known as the outer clutch assembly, having its friction disc and its pressure plate fully surrounding the other clutch assembly, known as the inner clutch assembly, and the clutch further comprising a circulation circuit provided for th circulation of cooling fluid in the said clutch assemblies.

Preferably, for one of the clutch asssemblies, the engagement means are hydraulic, whilst the disengagement means are elastic, so that the said one clutch assembly is thus permanently urged into disengagement by the elastic means, whereas, for the other clutch assembly, the engagement means are elastic whilst the disengagement means are hydraulic, so that this said other clutch assembly is thus permanently urged into engagement by the said elastic means.

Thanks to this arrangement, if the fluid supply fails, one of the clutch assemblies remains in engagement, this assembly in practice being the one which corresponds to the movement coupling, whilst the other remains disengaged, this assembly in practice being the one which corresponds to the force c upling.

In other words, if the supply of fluid fails, the vehicle in question is still capable of travel, which is generally advantageous, all the more so as, if the vehicle has caterpillar tracks, as is usually the case, in order to stop the advance of the vehicle if so desired it is sufficient to disengage the clutches normally provided for the purpose of changing direction. Only the force coupling is arrested, which is also usually advantageous.

However, in the clutches described in US patents Nos. 2 712 373 and 3 746 138 referred to above, failure of the fluid supply leaves both clutch assemblies in question irremediably disengaged.

Preferably the cooling fluid and the fluid for the engagement and disengagement means consist of one and the same fluid which is delivered jointly by one pump controlled by control means.

Advantageously, the output of the pump is directly connected to the engagement and/or disengagement means, via control means, whereas th circulation circuit for the cooling fluid is connected to this pump output by an orifice controll d by a throttle valv , this valve comprising a piston mounted so as to be freely movable in a bore and urged by a spring towards a position in which it blocks

the said orifice, the spring preferably abutting a second piston which is itself mounted so as to be movable in a bore which is larger in diameter than the previous one, and behind which second piston this bore is connected to a channel controlled by the control means.

Thus, a return pressure is applied to this throttle valve, at léast for certain operating conditions. Even so, the pressure in the circulation circuit for the cooling fluid always remains sufficiently low to ensure that this fluid is not capable of causing accidental disengagement of this clutch assembly, not even partial disengagement.

Embodiments of the invention will now be described, by way of example only, and with reference to the accompanying schematic drawings, wherein:

Figure 1 is an axial section through a clutch with two outputs according to the invention, on the broken line I–I in Fig. 2;

Figure 2 is a cross sectional view on the line II–II in Fig. 1;

Figures 3, 4 5 and 6 are sections on the generally broken lines III–III, IV–IV, V–V and VI–VI, respectively, in Fig. 2;

Figure 7A is a block diagram of the control means and the throttle valve which this clutch comprises, for a first position of these means;

Figures 7B, 7C and 7D are block diagrams analogous to that of Fig. 7A, for other positions of the control means and throttle valve;

Figure 8 partly reproduces Fig. 1 and relates to an alterative embodiment;

Figure 9 also partly reproduces Fig. 1 and relates to another alternative embodiment.

As shown in Fig. 1, the clutch with two outputs according to the invention comprises, in a common casing 10, two distinct clutch assemblies A, B arranged so as to be fully annularly one inside the other.

The reaction plate 11A of the radially outermost clutch assembly A, acts as the flywheel of the assembly, this reaction plate being rotationally fast with a shaft 12 which is, in practice, a driving shaft.

Mounted on the periphery of the reaction plate 11A by means of screws 13 and disposed axially of the reaction plate 11A there is a bell-shaped member 14, the central recessed, region of which forms a hub 15.

Also axially mounted on the reaction plate 11A, by means of screws 16, there is a socket 17 inside which is mounted the clutch assembly B.

The socket 17 is surrounded, with play, by a second b ll-shaped member 18A formed with a hub 19A at its central region. The hub 19A, which is centered in the hub 15 by means f rolling bearings 20, is rotationally fast, by means of interengaging grooves, with a tubular shaft 22A forming the output, or driven shaft of the clutch assembly A.

In the embodiment shown, the clutch assembly A is of the multidisc type. Around the bell-shaped member 18A there are two friction discs 23A, which are mounted so as to be axially movable and which by means of a grooved mounting on the bell-shaped member 18A, are rotationally fast therewith.

The friction discs 23A are separated from each other by an intermediate plate 24A which is mounted so as to be axially movable and is rotationally secure with the bell-shaped member 14 by means of lugs 25 engaging in axially disposed slots 26 therein.

Finally, the clutch assembly A comprises a pressure plate 27A which, like the intermediate plate 24A, is mounted so as to be axially movable whilst being rotationally integral with the bell-shaped member 14 by means of lugs 28 engaging in the slots 26 in said member 14.

The pressure plate 27A is associated with engagement means adapted to urge it towards the reaction plate 11A, and disengagement means adapted to urge it in the opposite direction.

In the embodiment shown, the engagement means are elastic; in practice, they consist of a frustum-shaped washer 30, of the Belleville washer type, which abuts with its inner periphery on the pressure plate 27A and abuts with its outer periphery on the bell-shaped member 14.

The disengagement means of the clutch assembly A are hydraulic, in the illustrated embodiment.

For this purpose, the pressure plate 27A is attached by screws 31 to a piston 32 defining, together with that surface of the bell-shaped member 14 remote from the reaction plate 11A, a pressure chamber 33A.

This pressure chamber communicates, via passages 34A in the wall of the bell-shaped member 14, with a supply groove 35A formed on the periphery of the hub 15. The hub 15 is surrounded by a rotationally fixed flange 36 on which is mounted, aligned with the groove 35A, a connecting ferrule 37A which communicates with a channel 38A, (Figs. 1 and 3).

The pressure chamber 33A also communicates with the space inside the bell-shaped member 14 but via valves 39A which are sensitive to centrofugal force. The pressure chamber 33 A thus communicates, via the slots 26 in the member 14, with the space inside the casing 10, thus forming a pressure release vent.

A band brake is associates with the output shaft 22A of clutch assembly A, which forms the input shaft of a gear box. A band brake of this kind, which is described in detail in British patent application No. 36629/78 does not constitute a part of this invention and is therefore not described in detail here. In Fig. 1, the solid line shows the rotary part 40A of the band brake, which is keyed to be rotationally fast on the shaft 22A, and the broken

lines show its fixed control portion 41A; it need only be said that this latter portion is made up of a hydraulic unit shown in detail in Fig. 3 and also shown in Fig. 4.

The reaction plate 11B of the clutch assembly B is carried by the socket 17 at its free end, i.e. at its end opposite the reaction plate 11A.

The associates pressure plate 27B is a slidably mounted annular piston, mounted between the socket 17 and a socket 42, which is coaxial with and arranged inside, the socket. 17 The pressure plate 27B thus defines, together with the sockets 17 and 42 and the reaction plate 11A, a pressure chamber 33B which is connected, via passages 34B inside the reaction plate 11A and inside the wall of the bell-shaped member 14, to a supply groove 35B in the hub 15 of the bell-shaped member 14.

Via valves 39B sensitive to centrifugal force, the pressure chamber 33B communicates with the space inside the socket 17 and hence, as will become apparent hereinafter, with the space inside the casing 10.

Opposite the groove 35B, the fixed flange 36 comprises a connecting ferrule, not shown in the Figures which is connected to a channel 38B shown in Fig. 4, in particular.

Between the reaction plate 11B and the pressure plate 27B there is arranged in known manner a stack of friction discs 23B alternating with intercalary washers 24B, which are mounted so as to be axially movable.

The friction discs 23B are mounted, by means of interengaging grooves, on a hub 19B so as to be rotationally secure therewith, the hub 19B being in turn rotationally fast, by means of a grooved mounting, with an output shaft 22B of the clutch assembly B. The shaft 22B extends inside the tubular shaft 22A, and one of its ends is centered on the socket 42 by means of a rolling bearing 43.

A band brake of the type associates with the shaft 22A is associated with this output shaft 22B, which forms the shaft of a force coupling. In Fig. 1, the broken lines schematically show the rotary part 40B of this band brake, and the associates control portion 41B which, as before, is a hydraulic unit.

The intercalary washers 24B are rotationally fast, by means of a grooved mounting, with the socket 17. In the embodiment shown in Fig. 1, the socket 17 comprises for this purpose axially extending ribs 44 projecting radially inwards, whilst the inter-calary washers 24B comprise slots by means of which they engage the ribs 44.

The pressure plate 27B of the clutch assembly B is permanently subjected to elastic disengagement means which tend to move the stack of friction discs 23B away from the stack of intercalary washers 24B. In the embodiment shown, the elastic disengagement means comprises a helical spring 45, which bears on the pressure plate 27B and abuts an annular member 46 which is itself keyed to be axially fast with the socket 42.

Thus, in the clutch according to the invention, the friction discs 23A and the pressure plate 27A of the outer clutch assembly A fully surround the inner clutch assembly B.

A circulation circuit is provided for the circulation of cooling fluid in these clutch assemblies A and B. This circulation circuit notably comprises passages 34C communicating in pairs, provided in the various parts in question and in particular in the hub 15 of the bell-shaped member 14, the bell-shaped member 18A and the socket 17.

At one of its ends, the chain formed by these passages 34C opens freely into the space inside the casing 10, via the openings 26 in the bell-shaped member 14, and, at its other end, it communicates with a supply groove 35C provided on the periphery of the hub 15. Via a ferrule 37C formed on the fixed flange 36, the groove 35C communicates with a channel 38C.

In practice, the fluids used to supply the pressure chambers 33A and 33B, and th fluid used for cooling the clutch assemblies A and B, are identical. They are delivered together, controlled by control means described hereinafter, by the same pump 48 the rotor 49 of which is rotationally secure with the shaft 12, via the bell-shaped member 14, by methods which are known per se and not shown in detail in the drawings.

In Fig. 2, reference numeral 50 indicates the intake of this pump 48 and 51 indicates its output.

Via the control means described hereinafter, this output 51 is directly connected to the pressure chambers 33A, 33B, i.e. to the disengagement means of the clutch assembly A and to the engagement means of clutch assembly B, whilst the circuit for the circulation of cooling fluid is connected to the output 51 via an orifice 52 controlled by a throttle valve 53, (Figs. 2 and 6).

This throttle valve 53 comprises a first piston 54 which is mounted so as to be freely movable in a bore 55 the end of which is connected to the output 51. The orifice 52 which this piston 54 controls consists of an annular groove formed in the bore 55, Figs. 2, 4 and 6, aligned with a passage 56 with which the channel 38C mentioned above communicates. By means of a set of springs 57, the piston 54 is urged towards a position in which, as shown in Figs. 2 and 6, it blocks the orifice 52.

The set of springs 57 to which it is subjected abuts on a second piston 58 which is itself mounted so as to be movable in a bore 59 larger in diameter than the bore 55.

Behind this second piston 58 is formed a chamber 60.

In order to define their rest positions, the

pistons 54 and 58 are each provided with stops 61, 62 respectively, projecting axially in opposite directions.

The control means controlling the fluids in question also comprise (Figs. 3 and 5) two slide valves 63A, 63B.

The valve 63A which is associates with clutch assembly A comprises a piston 64A which is mounted so as to be movable in a bore 65A between two springs 66 and 67. The spring 66 abuts on a fixed element 68, whilst the spring 67 abuts on a slidably mounted rod 69 which is capable of assuming one of two positions under the control of a rotary cam 70 attached to a control linkage 71. The piston 64A is internally drilled with a blind bore 72 opening laterally, at one of its ends, via passages 73 (Fig. 3).

The outer periphery of the means piston 64A controls two grooves 75, 76. The groove 75 is in communication with a passage 77 which in turn communicates, via a passage 78, with the output 51 of the pump 48 (Figs. 2 and 5). The groove 76 communicates, via a passage 79, with the discharge, i.e. the internal space of the casing 10 (Figs. 3 and 5).

By means of its internal bore 72 and its lateral passages 73, the piston 64A is capable of putting the groove 75 into communication with a passage 80 opening out from the corresponding end 81 of the bore 65A, (Figs. 3 and 5). This passage 80 communicates with a passage 82 which serves not only the control unit 41A of the band brake associated with the clutch assembly A but also (Fig. 3), via the channel 38A and the connecting ferrule 37A, the pressure chamber 33A which constitutes the disengagement means for this clutch assembly.

The slide valve 63B associated with clutch assembly B is a simple reversing valve. Its slide 64B which is mounted so as to be movable in a bore 65B is capable, under the control of a control means 82 (Fig. 2), of occupying inside this bore one of two positions in which it brings a chamber 83 into communication alternately with either a connecting ferrule 84 or a connecting ferrule 85.

The chamber 83 communicates, via passages 77 and 78, with the output 51 of the pump 48. When it is not communicating with the chamber 83, the ferrule 84 communicates with the discharge, i.e. the inner space of the casing 10, whilst the corresponding end 86 of the bore 65B is open. Similarly, when it is not in communication with the chamber 83, the connecting ferrule 85 communicates with th discharge, via a passage 87 (Figs. 5 and 7A).

The ferrule 84 communicates with the channel 38B, via a channel 88 and an intermediate ferrule 89 (Figs. 2 and 4), while the ferrule tip 85 communicates, via a channel 90 (Figs. 5 and 1), with the control unit 41B for the band brake associated with the clutch assembly B.

The chamber 60 of the throttle valve 53 is connected (Fig. 2) to a channel 92 controlled by the control means described above. In practice, as shown in the drawings, this channel 92 is connected to a ball valve 93 the ball 94 of which is mounted so as to float freely between two seatings, one of which is formed at the outlet of a channel or passage 95 which communicates via the passages 80 and 82 (Figs. 2 and 3) with the pressure chamber 33A forming the disengagement means for clutch assembly A, whilst the other seating is formed at the outlet of a channel or passage 96 which communicates (Figs. 2 and 4) via the intermediate ferrule 89 and the channel 38B with the pressure chamber 33B forming the engagement means associated with the clutch assembly B.

As soon as the input shaft 12 rotates, the pump 48 is in operation. Its output pressure is sufficient to cause a substantial displacement of the first piston 54 in the throttle valv 53, so that the orifice 52 controlled by the latter is at least partially released and a circulation of the cooling fluid is thus ensured.

The positions of the slides 64A, 64B of the valves 63A, 63B as shown in Figs. 1 to 6 and Fig. 7A, correspond to the passage 80 and the ferrule 84 being unpressurized, and hence to the pressure chambers 33A, 33B, also being unpressurized.

Urged by the elastic washer 30, the pressure plate 27A clamps the friction discs 23A; clutch assembly A is engaged. At the same time, urged by the spring 45, the pressure plate 27B is moved away from the friction discs 23B and clutch assembly B is disengaged.

Similarly, via the valve 93 the ball 94 of which is then in an intermediate position between its two seatings (Fig. 7A), the rear chamber 60 of the throttle valve 53 is also unpressurized.

The second piston 58 of the throttle valve 53 is thus in the extreme position of abutment against its stop 61, and the pressure of the circulation circuit for the cooling fluid controlled by the first piston 54 of the throttle valve 53 is low.

At the same time, the control unit 41B of the band brake associated with clutch assembly B is supplied with fluid via the channel 78, the groove 75, the chamber 83 and the channel 90, and this band brake is therefore applied.

We will now suppose, referring to Fig. 7B, that the rod 69 of the valve 63A is in the second of its positions, under the control of the cam 70, in which position the lateral passages 73 of the slide 64A are adjacent and communicating with the groove 75, whilst this slide is blocking the groove 76, and that the slide 64B of the valve 63B is in the same position as before.

Through the inner bore 72 of the slide

64A, the fluid under pressure delivered by the pump 48 is passed simultaneously into the control unit 41A of the band brake associated with clutch assembly A and into the hydraulic chamber 33A forming the engagement means for said assembly.

The piston 32 moves the pressure plate 27A, counter to the elastic washer 30, to release the friction discs 23A. The clutch assembly A is disengaged whilst its band brake is clamped.

Via the valve 93, the ball 94 of which is now blocking the channel 96, fluid under pressure is passed into the rear chamber 60 of the throttle valve 53 with the result that the second piston 58 of the latter is displaced towards the first piston 54 and compresses the set of springs 57 interposed between these two pistons.

Moreover, taking into account the differences in cross section between the corresponding bores 55, 59, the movable assembly consisting of the two pistons 54, 58 is then subjected to a differential force the result of which is that the pressure in the circulation circuit for the cooling fluid, which it governs, remains moderate, in spite of the increase in output pressure of the pump 48.

The same is true if clutch assembly B is engaged whilst the clutch assembly A is disengaged, the pressure chambers 33A and 33B both being supplied with fluid under pressure (Fig. 7D), and if both these clutch assemblies are engaged (Fig. 7C). In the latter case, the ball 94 of the valve 93 blocks the channel 95.

Thanks to the throttle valve according to the invention, the pressure in the circulation circuit for the cooling fluid is thus always moderate and is therefore not liable to cause accidental disengagement of clutch assembly A.

In all cases, the shoulder 99 separating the bores 55, 59 of this throttle valve from each other limits the advance of the piston 58 towards the piston 54 and hence limits the compression of the set of springs 57.

As will be appreciated, the valves 39A, 39B limit the pressure in the pressure chambers 33A, 33B in the engaged state and thus alleviate the consequences of the centrifugal force, preventing any untimely disengagement caused by this force.

In the alternative embodiment shown in Fig. 8, instead of ribs 44, the socket 17 has slots 100 and is surrounded by a reinforcing belt 101; at the same time, the intercalary washers 24B have radial lugs 102 which engage in these slots 100.

In this embodiment, the bell-shaped member 18A is in two parts connected to each other by rivets 103.

Furthermore, in this embodiment, the reaction plate 11A is also in two parts 11'A, 11''A connected to each other by screws 104. The part 11'A forms the flywheel proper, which is integral with the shaft 12, whilst the part 11''A, independently of the part 11'A, ensures that the passage 34B is sealed off between said part and the bell-shaped member 14.

In the alternative embodiment shown in Fig. 9, the elastic washer 30 bears on the piston 32 and the piston in turn bears on the pressure plate 28. The latter is attached by means of flexible lugs to the bell-shaped member 14, according to methods known per se, and retaining members are provided between the pressure plate 28 and the piston 32, to prevent the latter from rotating about the axis of the assembly.

In addition, as in the alternative embodiment in Fig. 8, the reaction plate 11A is in two parts.

Obviously, this invention is not limited to the embodiments described and shown, but covers all variants and/or combinations of the various features.

CLAIMS

1. A clutch with two outputs, notably for a tractor having a force coupling, comprising, in a casing, two clutch assemblies each comprising a first plate, known as the reaction plate, rotationally fast with a first shaft, generally a drive shaft, at least one friction disc mounted so as to be axially movable relative to said reaction plate and rotationally fast with a second shaft, generally a driven shaft, a second plate, known as a pressure plate, mounted so as to be axially movable relative to the reaction plate and rotationally fast therewith, engagement means adapted to urge the pressure plate towards the reaction plate, and disengagement means adapted to urge the pressure plate in the direction away from the reaction plate, the two clutch ass mblies being arranged fully annularly one inside the other, one of said clutch assemblies, hereinafter termed the outer clutch assembly, having its friction disc and its pressure plate fully surrounding the other clutch assembly, hereinafter termed the inner clutch assembly, and a circulation circuit for circulation of cooling fluid in said clutch assemblies.

2. A clutch according to Claim 1, in which, for one of the clutch assemblies, the engagement means are hydraulic, whereas the disengagement means are elastic; the said one clutch assembly therefore being permanently urged into disengagement by said elastic means, whilst, for the other clutch assembly, the engagement means are elastic whilst the disengagement means are hydraulic, so that this said other clutch assembly is thus permanently urged into engagement by said elastic means.

3. A clutch according to Claim 2, in which it is the outer clutch assembly whose engagement means are elastic.

4. A clutch according to Claim 2, in which

the cooling fluid and the fluids for the engagement and disengagement are delivered by the same pump, under the control of control means.

5. A clutch according to Claim 4, in which, via said control means, the output of the pump is directly connected to the engagement and/or disengagement means, whereas the circulation circuit for the cooling fluid is connected to said output of the pump via an orifice controlled by a throttle valve, said valve comprising a piston mounted so as to be freely movable in a bore and urged by a spring towards a position in which it blocks said orifice.

6. A clutch according to Claim 5, in which the spring abuts a second piston which is itself mounted so as to be movable in a bore which is larger in diameter than the previous one and, at the back of this second piston, this second bore is connected to a channel controlled by the control means.

7. A clutch according to Claim 6, in which said channel is connected to a ball valve the ball of which is mounted so as to float between two seatings, one of which is formed at the outlet of a channel communicating with the hydraulic engagement means, and the other being formed at the outlet of a channel communicating with the hydraulic disengagement means.

8. A clutch according to any of Claims 1 to 7, in which the reaction plate of the outer clutch assembly, which acts as the flywheel, axially carries a socket inside which is housed the inner clutch assembly, the said socket having, at its free end, the reaction plate of said inner clutch assembly.

9. A clutch substantially as hereinbefore described with reference to, and as illustrated in, Figs. 1 to 7D or Figs. 2 to 8 or Figs. 2 to 9 of the accompanying drawings.

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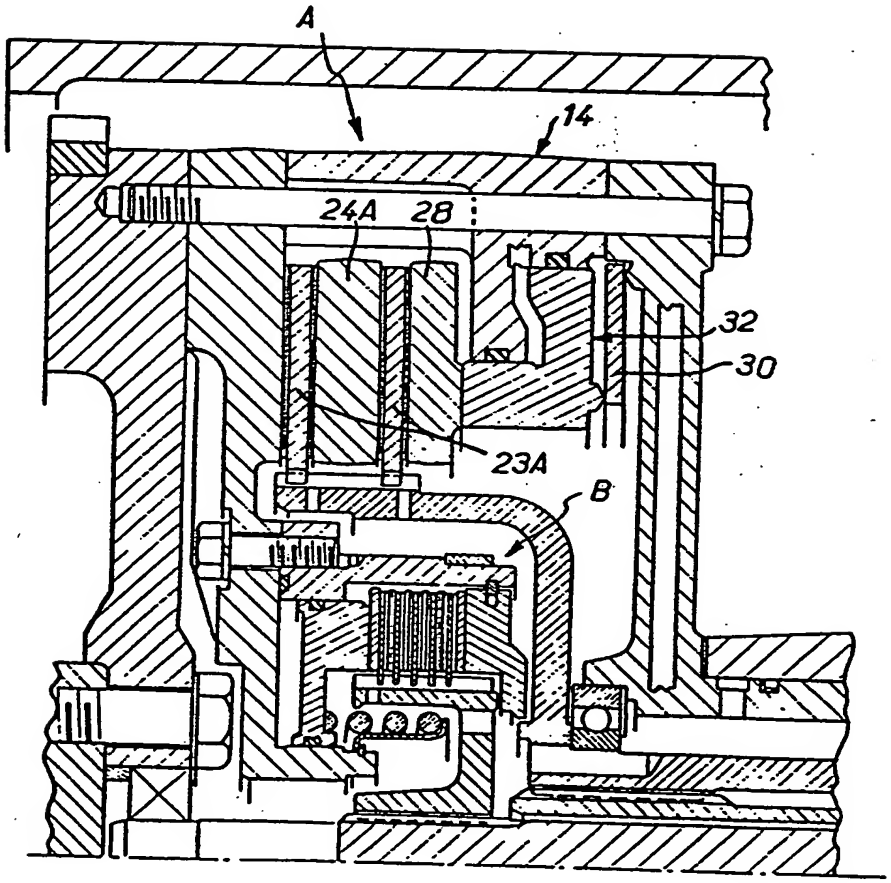
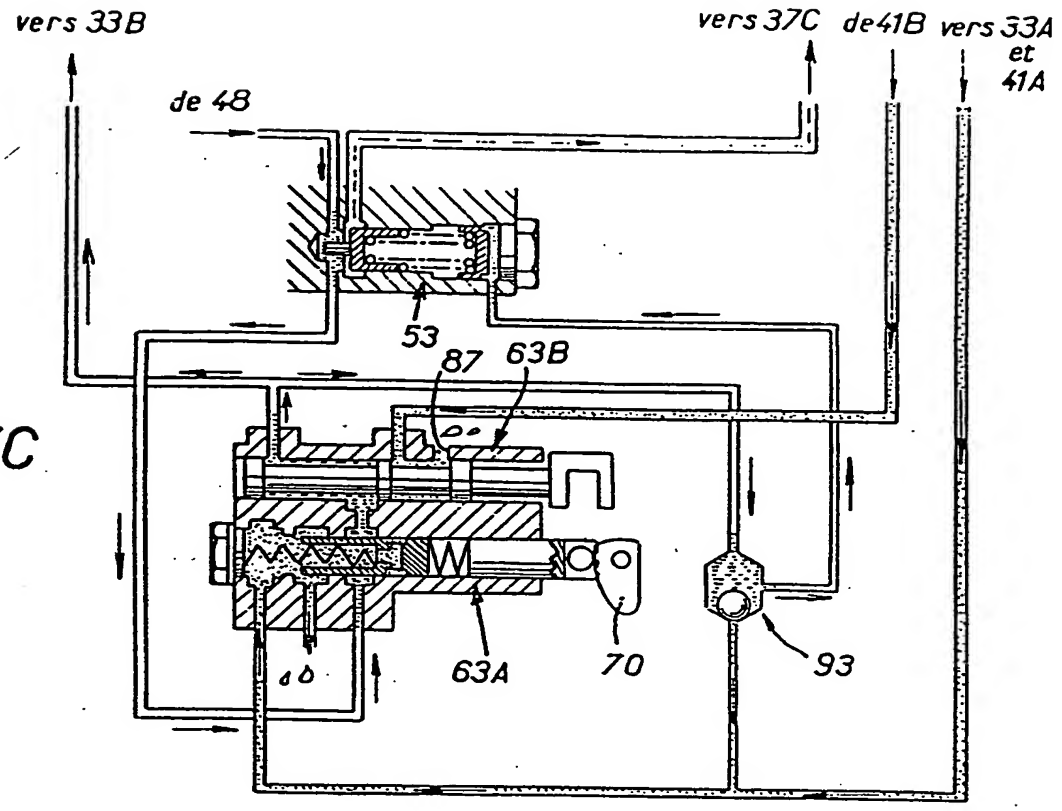
FIG. 9

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vers 37C
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vers 33A et 41A
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63B
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FIG.7C

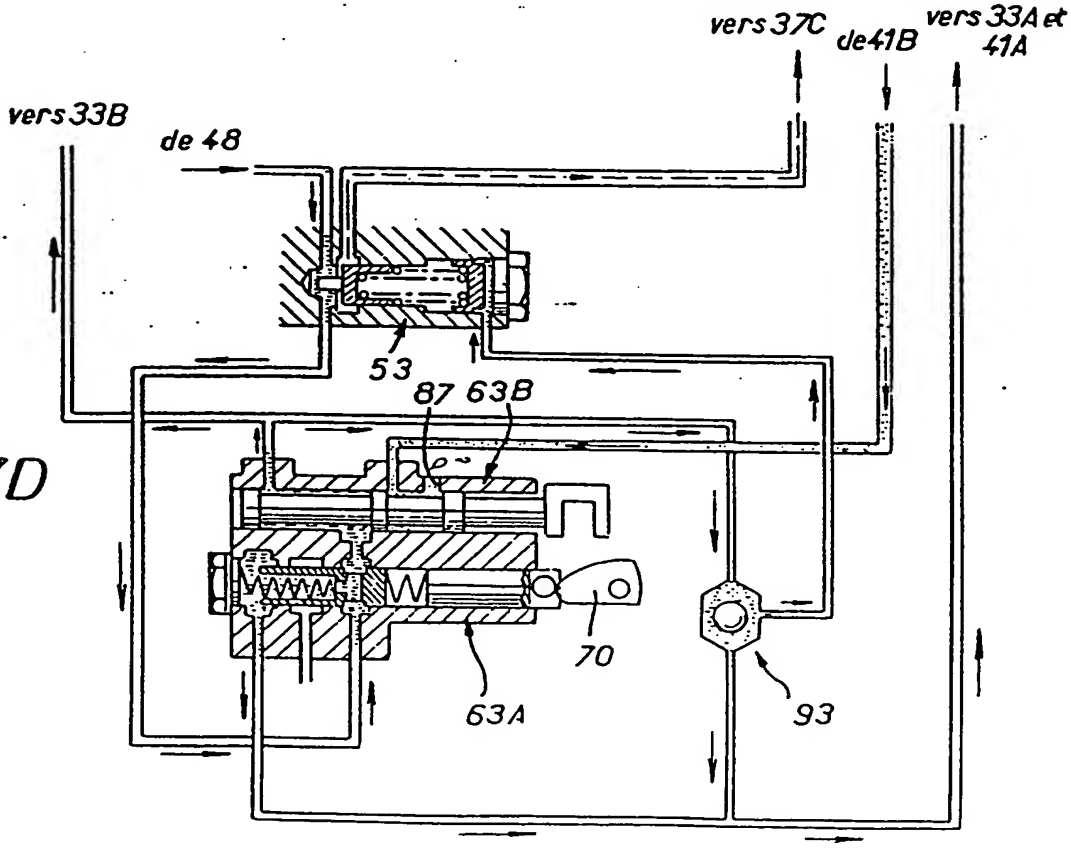
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FIG.7D

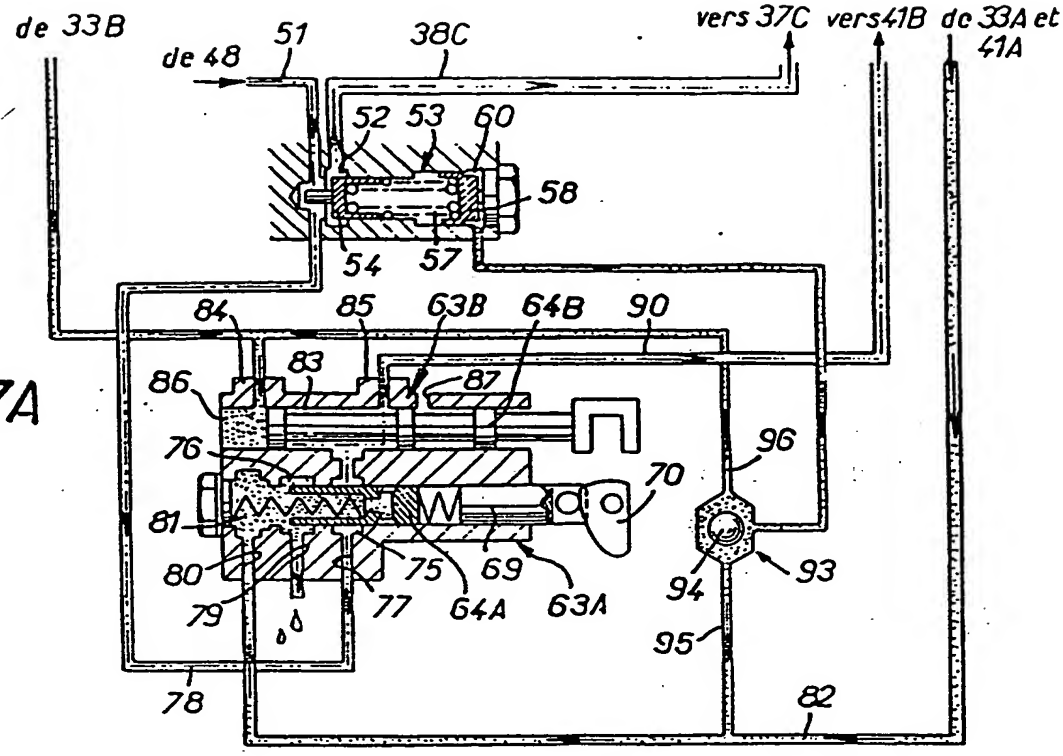
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FIG.7A

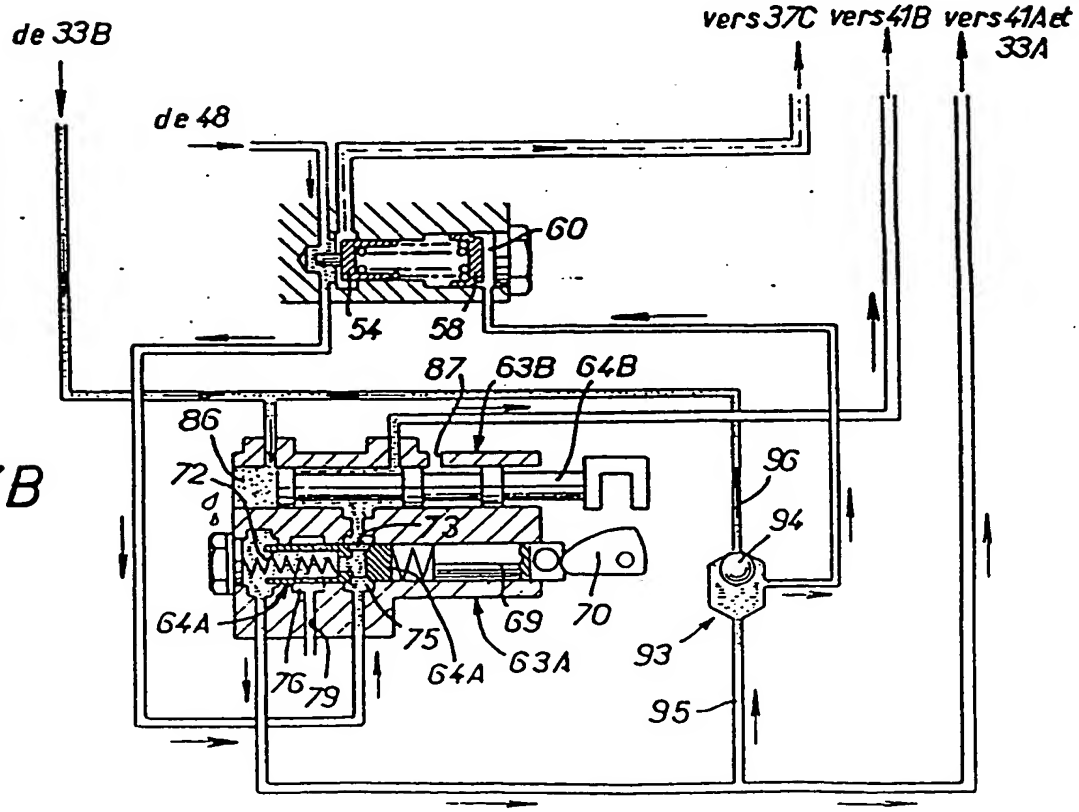
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FIG.7B

FIG.4

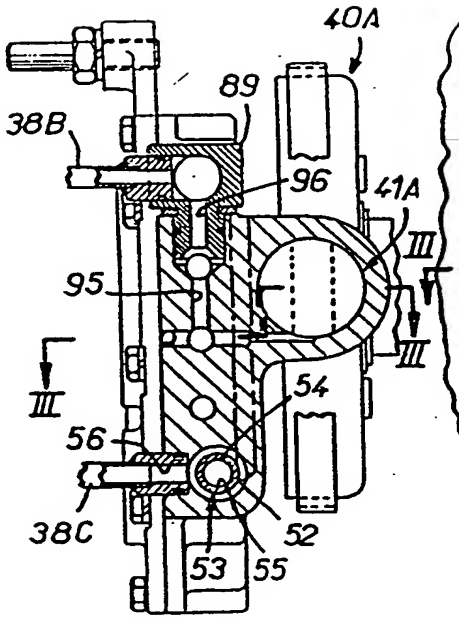


FIG.5

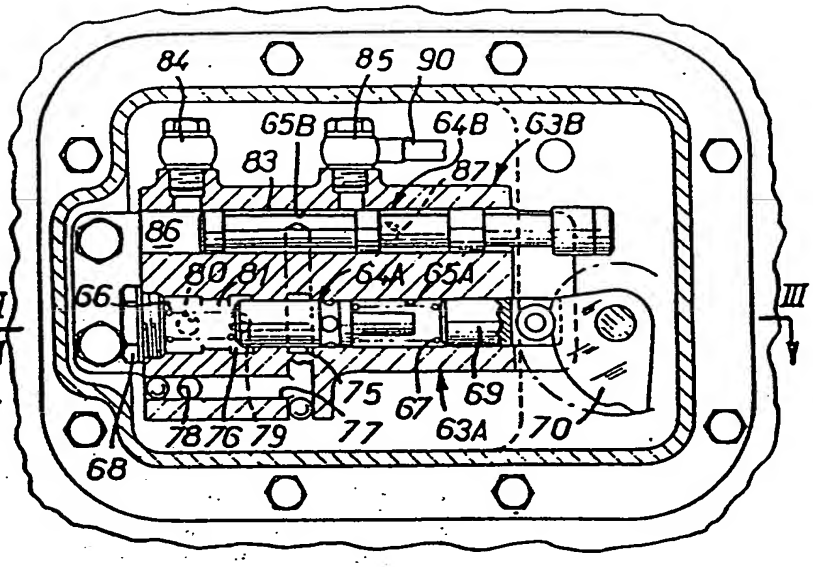


FIG.6

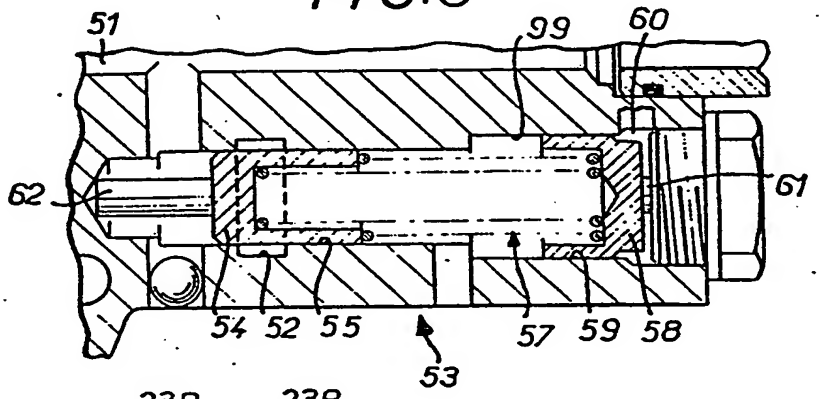


FIG.8

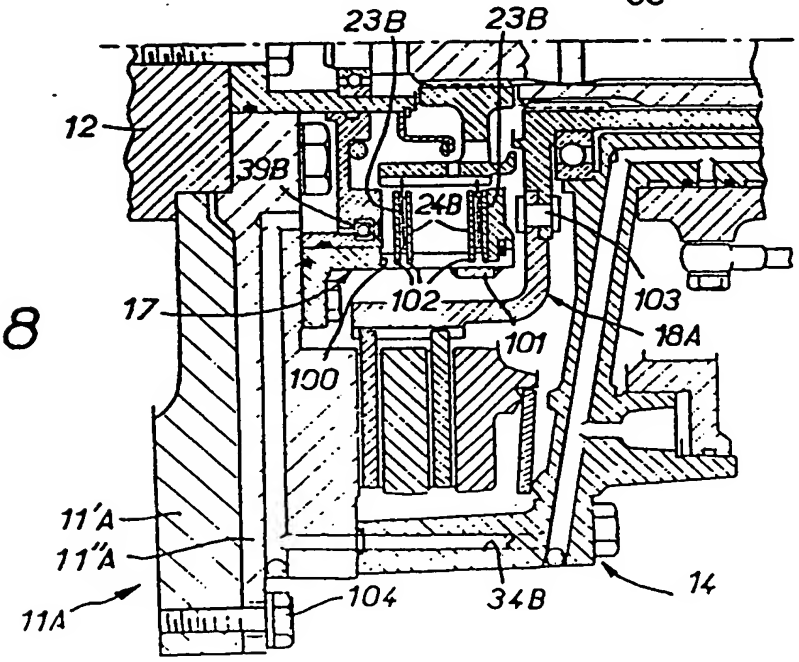


FIG.2

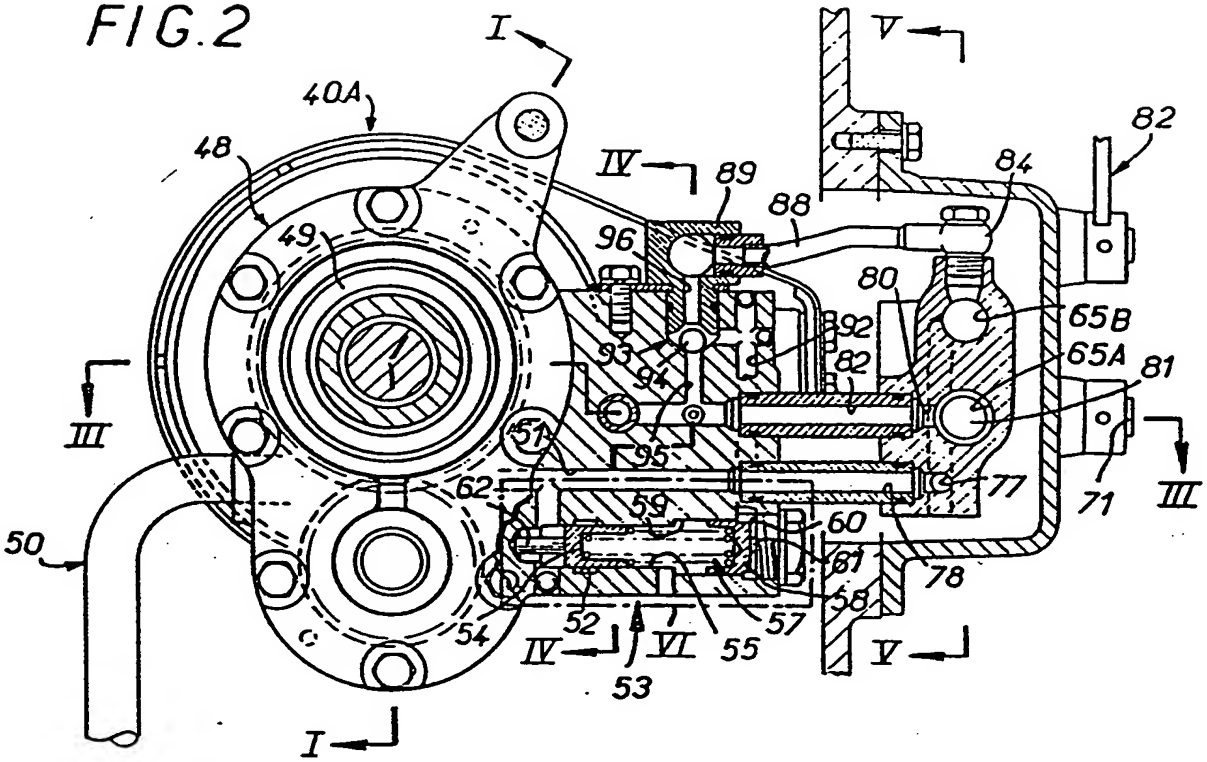

I
V
40A
82
48
IV
89
84
88
49
96
80
65B
92
93
94
82
65A
81
III
51
95
77
71
III
62
59
60
50
61
78
58
54
52
IV
VI
55
57
V
53
I

FIG.3

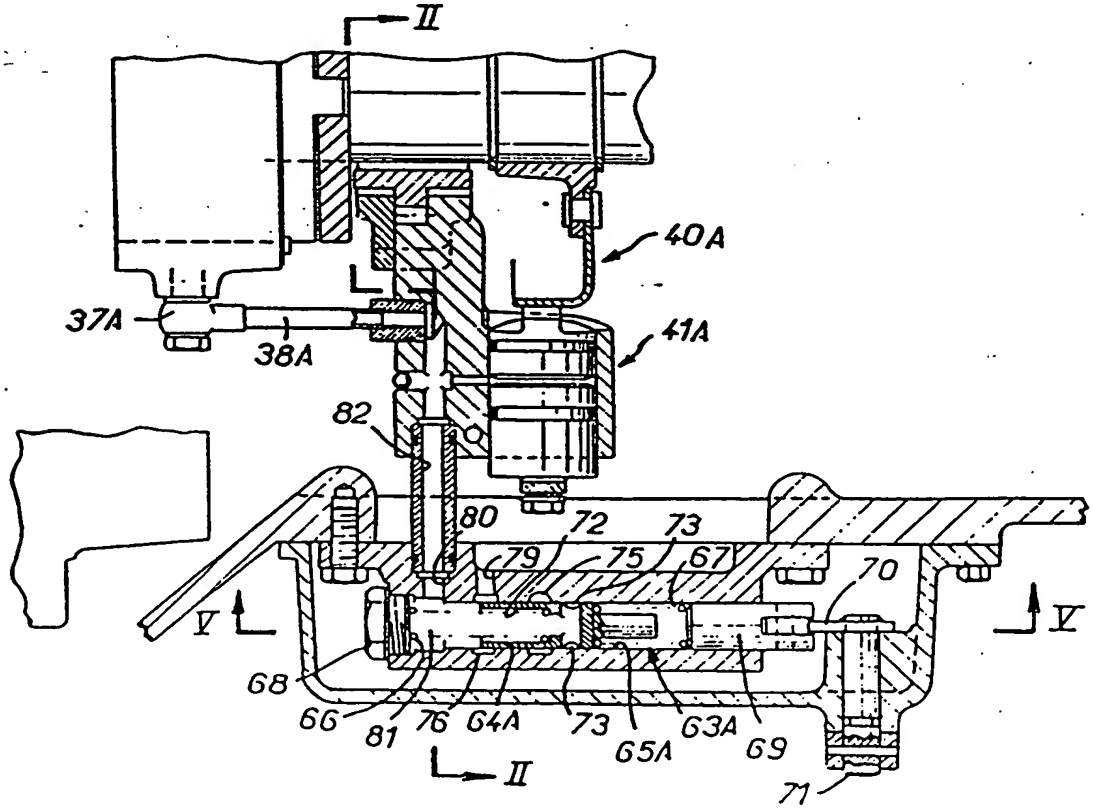
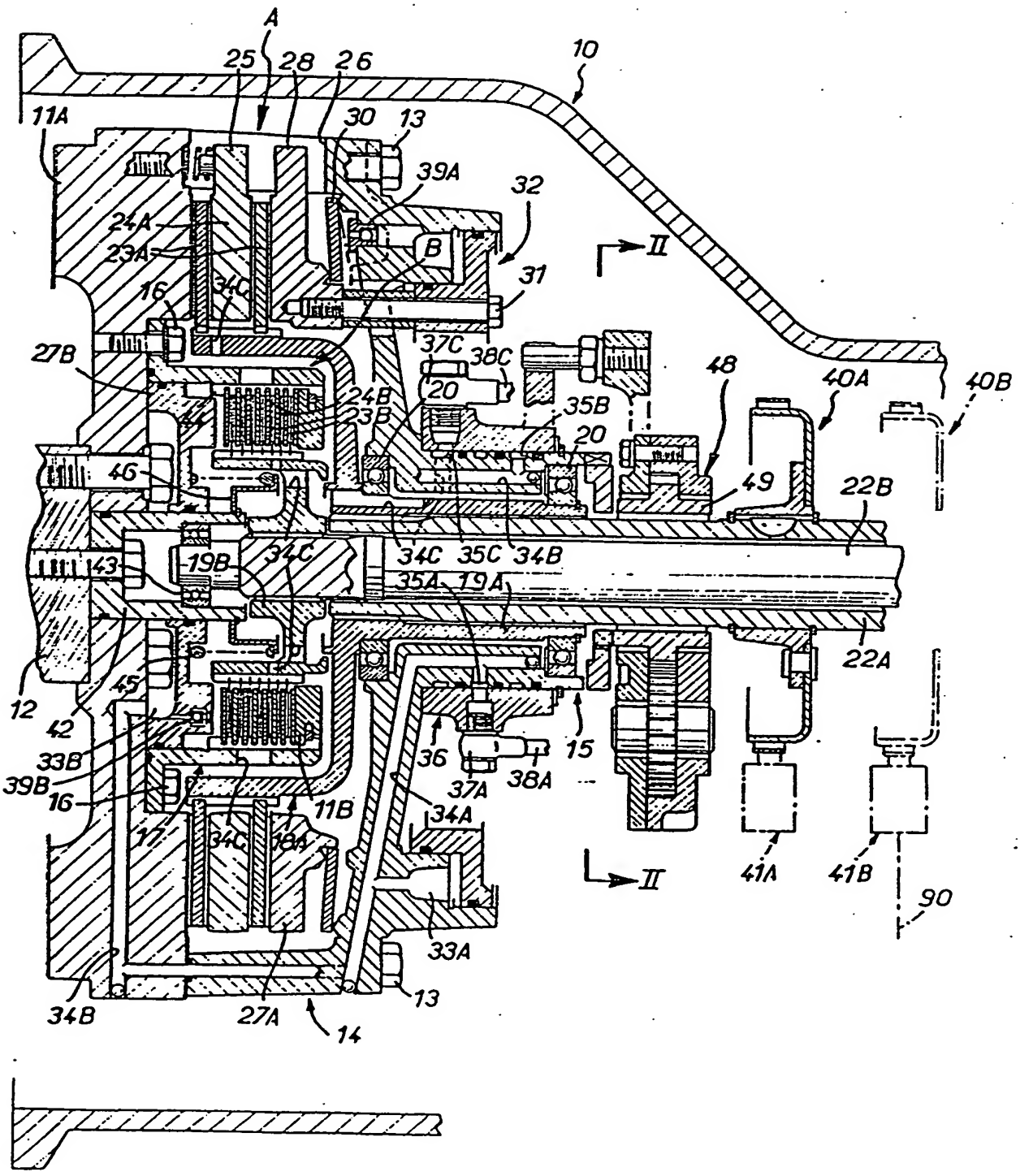

II
40A
37A
38A
41A
82
80
72
73
79
75
67
70
V
V
68
66
81
76
64A
73
65A
63A
69
II
71

FIG.1


A
25
28
26
10
11A
30
13
39A
32
24A
23A
B
II
16
34C
31
27B
37C
38C
48
40A
40B
24B
23B
20
35B
20
46
49
22B
43
19B
34C
34C
35C
34B
35A
19A
22A
12
45
42
33B
39B
16
36
37A
38A
15
11B
34A
17
34C
18A
II
41A
41B
90
33A
13
34B
27A
14